TM 11-6740-203-25

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

MAINTENANCE MANUAL
PHOTOGRAPHIC FILM PROCESSING UNIT PH-668/U

HEADQUARTERS, DEPARTMENT OF THE ARMY

AUGUST 1958

WARNING

HIGH VOLTAGE
is used in this equipment

DEATH ON CONTACT
may result if safety precautions
are not observed.

When making any repairs on the processor be sure that no power is applied to the equipment.

TECHNICAL MANUAL
No. 11-6740-203-25

HEADQUARTERS,
DEPARTMENT OF THE ARMY,
WASHINGTON 25, D. C., *18 August 1958*

PHOTOGRAPHIC FILM PROCESSING UNIT PH-668/U

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CHAPTER 1

INTRODUCTION

1. Scope

a. This manual covers organizational, field, and depot maintenance for Photographic Film Processing Unit PH–668/U. It includes theory, troubleshooting, and repair of the equipment. The operating instructions for this equipment are contained in TM 11–6740–203–10, Operator's Manual, Photographic Film Processing Unit PH–668/U.

b. Forward comments concerning this manual to the Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

Note. For applicable forms and records, see paragraph 2, TM 11–6740–203–10.

2. Theory

Note. Refer to TM 11–6740–203–10 for figures illustrating applicable component parts referenced in *a* and *b* below.

a. Manual Operation. Manual power is transferred through the crank handle (10, fig. 2) to the drive gear (12). The drive gear is meshed with the pivot gear (11) and swings the pivot gear in the same direction in which the crank handle is rotated until the pivot gear engages the gear and stud assembly (5) on one of the processing reels. The processing reel to which the power is finally transferred becomes the take-up reel which, in turn, simultaneously pulls the film being processed through the processing solution and winds the film. The processing reel, which is not engaged with the pivot gear, is left floating and continues to pay out film at the rate demanded by the take-up reel (depending on the speed at which the crank handle is rotated). This action continues until the film is completely played out from the floating processing reel or until the direction of rotation of the crank handle is reversed. If the crank handle is turned until the film is completely payed out from the floating processing reel, both processing reels will come to a stop, due to the film being secured to the core of the floating processing reel), braking the gears transferring manual power and the crank handle; this indicates that the turning direction of the crank handle has to be reversed. When the direction of the crank handle rotation is reversed, the drive gear (12) swings the pivot gear (11) to the opposite side, engaging the gear and stud assembly (5) of the floating processing reel which then becomes the take-up reel.

b. Motor Driven Operation. Electrical power is transferred to the motor (6, fig. 3) through the adapter plug (1), connector plug (2), and wire cable (3). The power cable switch (5) controls the electrical power to the motor. The motor converts electrical power to mechanical power which is, in turn, transferred to the crank handle (10, fig. 2) through the clutch assembly (9, fig. 3). One of the two extensions on the clutch assembly (located 180° apart on the driven clutch member) picks up the crank handle and carries it around in the same direction as the rotation of the motor at the rate of approximately 80 revolutions per minute (rpm). Mechanical power is transferred to the processing reels in the same manner as manual power (*a* above). Whenever the film is reeled off from one processing reel and wound up on the other, both processing reels come to a stop. The pressure exerted against the pivot gear (11, fig. 2) by the stopping of the processing reel being driven, is transmitted back through the drive gear, the crank handle, and the clutch assembly to the motor shaft. A clutch assembly (9, fig. 3) attached to the motor shaft takes up the pressure by allowing its driving member to rotate in the old direction while the driven member is brought to a halt, thereby actuating a switch built into the motor. The actuating of the switch then reverses the rotation of the motor shaft, and the clutch assembly again picks up the crank handle and the entire procedure is repeated.

CHAPTER 2

MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3. Scope of Maintenance Instructions

The instructions in this chapter cover all echelons of maintenance for Photographic Film Processing Unit PH–668/U except operator's preventive maintenance, which is covered in TM 11–6740–203–10.

4. Tools and Materials

Parts normally stocked for organizational, field, and depot maintenance will be listed in the Repair Parts and Special Tools List. The tools and materials required are as follows:

a. Tool Equipment TK–77/GF.

b. Cellulose sponge (Federal stock No. 7920–240–2561).

c. Scouring powder (QM 51–P–2595).

Section II. PREVENTIVE MAINTENANCE

5. Visual Inspection

Before operating the equipment, check the operator's repair tag. This will save repair time and may avoid damage to the equipment. If no repair tag is attached to the equipment, inspect the equipment for the following possible defects.

a. Processor.

(1) Loose or missing screws.
(2) Missing or broken parts.
(3) Bent or worn parts.
(4) Rust, corrosion, or roughness of working surfaces.

b. Motor Assembly.

(1) Loose or missing parts.
(2) Bent, broken, or worn parts.
(3) Cut, frayed, or worn power cable.
(4) Loose or damaged clutch assembly.
(5) Defective motor support post.
(6) Burned-out motor.

6. Preventive Maintenance Procedures

a. Use of DA Form 11–256. DA Form 11–256 (fig. 1) is a preventive maintenance checklist to be used by organizational maintenance personnel. Items not applicable to the equipment are lined out in the figure. References in the ITEM block are to paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for use of the form appear on page 1 of the form. Additional preventive maintenance information concerning items 2, 3, 5, 7, and 10 on DA Form 11–256 will be found in the preventive maintenance portion of TM 6740–203–10.

b. Items. The information in this paragraph is supplementary to DA Form 11–256. The item numbers correspond to the ITEM numbers on the form.

***Warning:* Disconnect the power cable from the power source when working on the motor assembly. When maintenance is completed, reassemble the equipment, reconnect the power cable, and check for satisfactory operation.**

Item	Maintenance procedure
12	Check the clutch assembly for slippage by momentarily pressing against the clutch assembly while the motor is operating. If the motor does not reverse itself, check to see that the set screw that holds the clutch assembly to the motor shaft is tight.
13	Check the locking clamps on the ends of the tank and the screws and nuts on the motor assembly to be sure that they are secure.
14	Feel the sides of the motor after the equipment has been operating for a short period of time. The motor should be cool to the touch.
16	Examine the component parts of the power cable. Check for aging and fraying of insulation. Examine the adapter plug (1, fig. 3), connector plug (2), and the switch (5). Check for missing, worn, broken, or burned parts. Check the switch for positive action and freedom from arcing.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF MAY 1958

NO.	DAILY ITEM	1 17	2 18	3 19	4 20	5 21	6 22	7 23	8 24	9 25	10 26	11 27	12 28	13 29	14 30	15 31	16	2D 3D ECHELON
1.	~~CLEAN EXTERNAL SURFACES OF OPTICAL COMPONENTS OF DUST, DIRT, INK, FINGER MARKS AND MOISTURE. (CAUTION: Use only approved cleaning methods as outlined in pertinent technical manuals).~~																	
2.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF COMPONENTS.																	✓
3.	INSPECT SWITCHES AND CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS AND POSITIVE ACTION.																	✓
4.	~~INSPECT FOR BURNED OUT OR BLACKENED PROJECTION LAMPS AND BLACKENED OR CRACKED REFLECTORS.~~																	
5.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.																	✓

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
6. ~~INSPECT BELTS AND/OR DRIVE CHAINS FOR PROPER JOINING, STRETCHED CONDITION, WEAR, AND/OR FRAYING.~~						
7. INSPECT EXPOSED METAL SURFACES FOR RUST, CORROSION AND CHIPPED PAINT.						
8. ~~CLEAN CONDENSING LENSES AND REFLECTORS OF DIRT, DUST, OILY FILM.~~						
9. ~~INSPECT APERTURE PLATE AND PRESSURE SHOES FOR BURRS.~~						
10. INSPECT REELS AND SPINDLES FOR DIRT, DUST AND LINT. CLEAN AS NECESSARY.						✓
11. ~~LUBRICATE IN ACCORDANCE WITH PERTINENT DA LUBRICATION ORDERS.~~						

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. INSPECT DRIVE CLUTCHES ~~AND PULLEYS~~ FOR SLIPPAGE. PAR. 6	✓
13. TIGHTEN ALL LOOSE MOUNTING SCREWS AND FASTENERS.	✓
14. OPERATE THE EQUIPMENT AND CHECK FOR OVERHEATING, SMOOTHNESS OF OPERATION AND UNUSUAL NOISE OR VIBRATION. PAR. 6	X
15. ~~CLEAN APERTURE PLATE ASSEMBLY, FILM PRESSURE SHOE ASSEMBLY, SPROCKET SHOE ASSEMBLY, GUIDEWAYS, SOUND DRUM, OF DIRT, OIL, DUST, CAKED EMULSION.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON ONSPECTIONS	START	END	CONDITION
16. INSPECT CORDS, CABLE, WIRE, SHOCKMOUNTS FOR CUTS, KINKS, BREAKS, FRAYING, UNDUE STRAIN. PAR. 6			✓
17. ~~ENTER READINGS OF ELAPSED TIME METER OVER MONTH COVERED BY THIS REPORT.~~			
18. ~~INSPECT SEATING OF READILY ACCESSIBLE PLUG-OUT ITEMS: TUBES, LAMPS, FUSES, CONNECTORS.~~			
19. ~~INSPECT TRANSFORMERS, CHOKE, POTENTIOMETERS AND RHEOSTATS FOR OVERHEATING AND OIL LEAKAGE.~~			

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

ITEM 14. CLUTCH ON MOTOR ASSEMBLY EXCESSIVELY NOISY. REPORTED TO 3RD ECHELON MAINTENANCE FOR REPAIR.

2 3

TM2333-12

Figure 1. DA Form 11–256, pages 2 and 3.

CHAPTER 3

TROUBLESHOOTING AND REPAIR

Section I. TROUBLESHOOTING

7. General Troubleshooting Information

a. General Instructions.

(1) Troubleshooting at organizational, field, and depot maintenance levels includes all the techniques outlined for operator's maintenance and any special techniques required to isolate the defective part. The field and depot maintenance procedures are not complete in themselves but supplement the preventive maintenance procedures (par. 6).

(2) Systematic procedures to be followed by maintenance personnel to isolate the cause of the trouble and correct the fault are listed in *b* below.

b. Procedures.

(1) *Sectionalization.* Sectionalization means tracing the fault to the major component responsible for abnormal operation. The general operation of the equipment (TM 11–6740–203–10) will serve as a check to help sectionalize the fault.

(2) *Localization.* Localization means tracing the fault to the defective section of the equipment through use of the troubleshooting chart (par. 8*c*).

(3) *Isolation.* Isolation means tracing the fault to the defective part by sight, touch, hearing, or detailed equipment checks.

8. Localizing Troubles

a. General. Depending on the nature of the operational symtoms, one or more of the localizing procedures (*c* below) will be necessary. When the following procedures result in localization of trouble to a particular section, use the techniques outlined in paragraph 5, if necessary, to isolate the trouble to a particular part.

b. Use of Chart. The troubleshooting chart (*c* below) supplements the operator's troubleshooting check list (TM 11–6740–203–10). If operational symtoms are not known, begin at item 1 of the operator's troubleshooting checklist and proceed as directed.

c. Troubleshooting Chart. The following chart is supplied as an aid in locating trouble in the processor and motor assembly.

Note. When performing the checks outlined below, refer to figures 2 and 3 and to the appropriate illustrations in TM 11–6740–203–10.

Symptom	Probable cause	Remedy
Motor does not rotate	Wire cable, switch, connector plug, or adapter plug defective.	Replace defective part (par. 11).
	Motor defective	Replace motor (par. 11).
Motor does not reverse itself	Clutch assembly slipping	Tighten set screw (8, fig. 3).
	Defective clutch assembly	Replace clutch assembly (par. 11).
Motor rotates unevenly	Film binding because of bent processing reel.	Straighten or replace processing reel (par. 10).
	Gears on cover assembly or processing reel worn or defective.	Replace defective gear (par. 10).
Processed film is fogged	Worn or damaged rubber cover seal	Replace rubber cover seal (par. 10).
Processed film unevenly developed.	Damaged processing reel or defective clutch assembly.	Replace processing reel (par. 10) or clutch assembly (par. 11).

Section II. DISASSEMBLY AND REASSEMBLY

9. General Parts Replacement Techniques

a. This section describes the preferred sequence of disassembly, inspection, and reassembly. The order of disassembly may be varied, if necessary. When major repair or replacement is necessary, follow the sequence of instructions until the defective part is reached.

b. Whenever a component part of the processor or motor assembly has been disassembled, examine each part to see that it is not bent, worn, or dirty. Clean and replace all parts as necessary. Be sure to check the repaired component after reassembly.

10. Cover Assembly and Processing Reels (fig. 2)

a. Disassembly.

(1) Remove the snapslide fastener (9) from the reel studs (4) by pressing the release clips of the snapslide fastener toward each other.

(2) Lift off the processing reels (photograph film reels (6)) with attached spring tension clip (7), gear and stud assemblies (5), and roundhead screw (8) from the reel studs (4).

(3) Remove the spring tension clips (7) from the cores of the photographic film reels (6) by sliding them off.

(4) Remove the gear and stud assemblies (5) from the photographic film reels (6) by backing out the roundhead screws (8) located inside the cores of the photographic film reels (6).

(5) Carefully remove the rubber covered seal (15) from the recess around the edge of the cover assembly (2).

(6) Remove the hexagonal nuts (1), the reel studs (4), and the flat washers (3) from the cover assembly (2).

(7) Remove the setscrew (13) and pull out the crank handle (10) from the cover assembly (2); remove the spacer (14), drive gear (12), and pivot gear (11).

b. Reassembly.

(1) Line up the holes of the pivot gear (11), drive gear (12), and spacer (14) with the hole on the cover assembly (2) in the order shown.

(2) Slip the long end of the crank handle (10) through the cover assembly (2), the assembled parts ((1) above) and the hole in the encircling bracket of the cover assembly (2).

(3) Install and tighten the setscrew (13) on the drive gear (12).

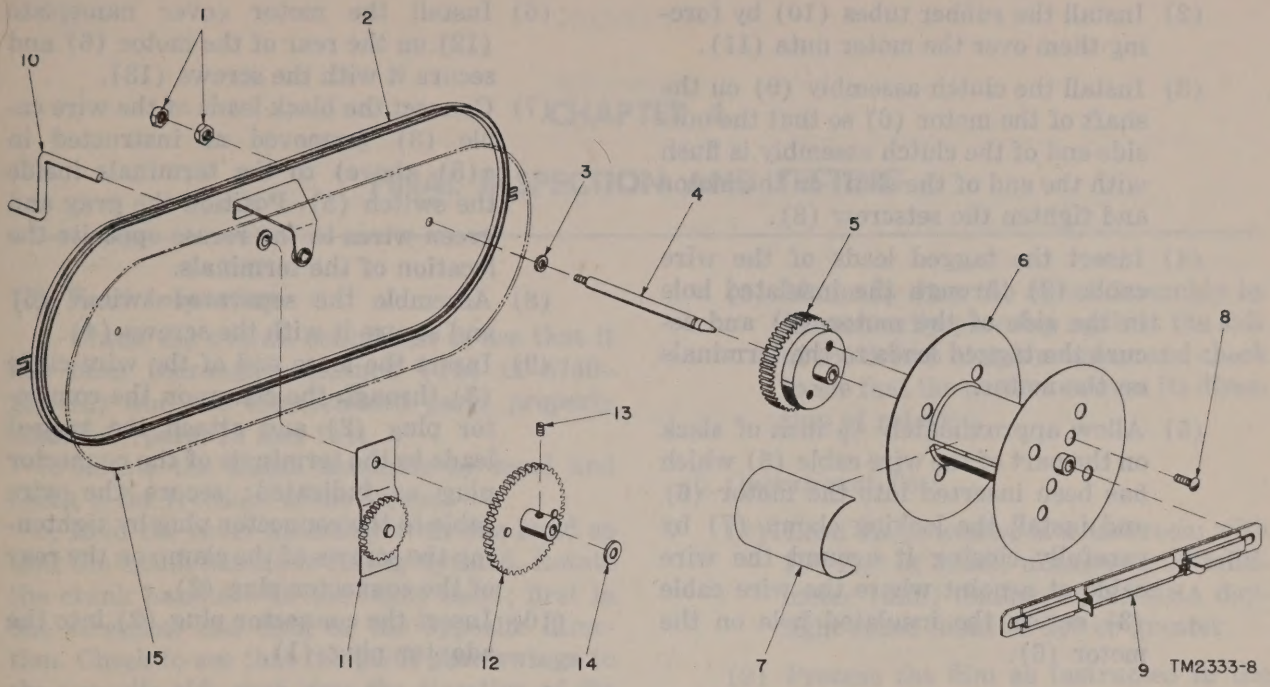
(4) Place the flat washers (3) on the threaded ends of the reel studs (4); insert the threaded ends of the reel studs containing flat washers through the cover assembly (2) and install the hexagonal nuts (1) on the threaded ends of the reel studs (4).

(5) Carefully press the rubber covered seal (15) into the recess around the edge of the rubber cover.

(6) Secure the gear and stud assemblies (5) to the photographic film reels (6) with the roundhead screws (8).

(7) Slip the spring tension clips (7) onto the cores of the photographic film reels (6).

(8) Install the processing reels (photographic film reels (6)) with attached spring tension clips (7), gear and stud assemblies (5), and roundhead screws (8) on the reel studs (4) so that the gear and stud assemblies (5) face the cover assembly (2). Secure the processing reels to the reel studs (4) with the snapslide fastener (9).



1 Hexagonal nut (No. 8–32 NC–2, stainless steel)
2 Cover assembly (MP14)
3 Flat washer (No. 8)
4 Reel (shaft) stud (MP16)
5 Gear and stud assembly (MP5)
6 Photographic film reel (MP17)
7 Spring tension (reel) clip (MP6)
8 Roundhead screw (slotted, self-tapping, type 2, No. 6 by ½ inch long)
9 Snapslide fastener (MP4)
10 Crank handle
11 Pivot gear (MP2)
12 Drive gear (MP1)
13 Set screw (socket, No. 6–32 NC–2 by 3/16 inch long)
14 Spacer (1/16 inch thick by ½ inch diameter, .265 inside diameter)
15 Rubber covered seal (MP3)

Figure 2. Cover assembly and processing reel, exploded view.

11. Motor Assembly
(fig. 3)

a. Disassembly.

(1) Disconnect the adapter plug (1) from the power source.
(2) Separate the connector plug (2) from the adapter plug (1).
(3) Loosen the screws of the clamp on the rear of the connector plug (2). Remove the wire cable (3) from the connector plug (2) and tag the leads.
(4) Remove the screws (4) from the switch (5) and separate the switch.
(5) Disconnect the two black wires from the terminals inside the switch (5) and remove the wire cable (3) from the switch.
(6) Remove the screws (13) that secure the motor cover nameplate (12) to the rear of the motor (6) and remove the motor cover nameplate.
(7) Tag and disconnect the leads of the wire cable (3) which are secured to the motor (6).
(8) Spread the locking clamp (7) that encircles the wire cable (3) and remove the locking clamp (7). Pull the tagged leads from the hole in the side of the motor (6).
(9) Loosen the setscrew (8).
(10) Gently pry the clutch assembly (9) from the shaft of the motor (6).
(11) Remove the rubber tube (10) from the motor nut (11) by carefully forcing it off.
(12) If required, remove the motor nut (11) from the motor (6) by turning the motor nut counterclockwise.

b. Reassembly.

(1) If removed, install the motor nut (11) on the motor (6).

(2) Install the rubber tubes (10) by forcing them over the motor nuts (11).

(3) Install the clutch assembly (9) on the shaft of the motor (6) so that the outside end of the clutch assembly is flush with the end of the shaft on the motor and tighten the setscrew (8).

(4) Insert the tagged leads of the wire cable (3) through the insulated hole in the side of the motor (6) and secure the tagged leads to the terminals on the motor.

(5) Allow approximately ½ inch of slack on the part of the wire cable (3) which has been inserted into the motor (6) and install the locking clamp (7) by carefully closing it around the wire cable at a point where the wire cable (3) enters the insulated hole on the motor (6).

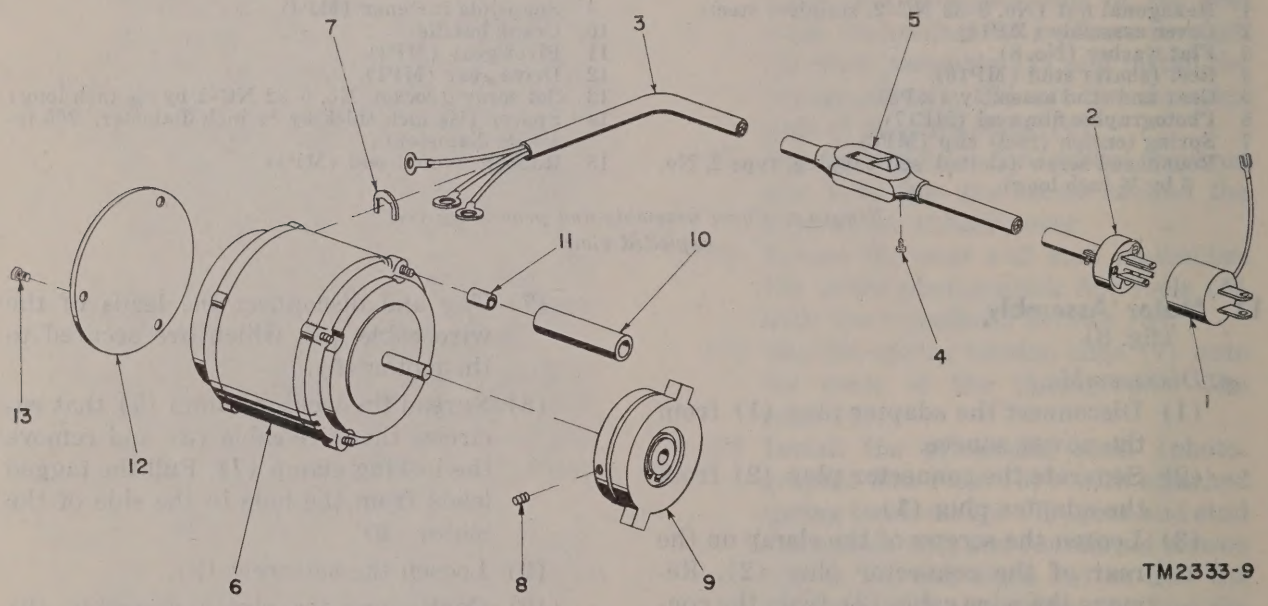
(6) Install the motor cover nameplate (12) on the rear of the motor (6) and secure it with the screws (13).

(7) Connect the black leads of the wire cable (3) (removed as instructed in *a*(5) above) to the terminals inside the switch (5). Position the gray and green wires in the recess opposite the location of the terminals.

(8) Assemble the separated switch (5) and secure it with the screws (4).

(9) Insert the loose end of the wire cable (3) through the clamp on the connector plug (2) and attach the tagged leads to the terminals of the connector plug as indicated; secure the wire cable to the connector plug by tightening the screws of the clamp on the rear of the connector plug (2).

(10) Insert the connector plug (2) into the adapter plug (1).



1 Adapter plug (P2)
2 Connector plug (P1)
3 Wire cable (W1)
4 Screw
5 Switch (A1)
6 Motor (B1)
7 Locking clamp
8 Set screw (No. 8–32 by ½ inch long)
9 Clutch assembly (MP13)
10 Rubber tube (MP12)
11 Motor nut (MP11)
12 Motor cover nameplate
13 Screw

Figure 3. Motor assembly, exploded view.

CHAPTER 4

FINAL INSPECTION AND TESTING

12. Final Inspection

a. Check the overall equipment to see that it has been thoroughly cleaned (TM 11–6740–203–10) and the disassembled parts properly installed (pars. 10 and 11).

b. Rotate the clutch assembly by hand and check it for freedom of movement.

c. Hold the cover assembly with one hand so that the crank handle is facing upward. Rotate the crank handle with the other hand; first in one direction and then in the opposite direction. Check to see that the pivot gear swings to the opposite side each time the direction of the crank handle rotation is reversed.

13. Final Testing

a. Dry Run Test.

(1) Assemble and connect the equipment for motor-driven operation (TM 11–6740–203–10), but do not load the processor with film or processing solutions.

(2) Place the switch in the ON position and allow the processor to run dry. Check to see that the clutch assembly properly engages the upper portion of the crank handle and carries it around in the direction in which the motor is rotating.

(3) Manually stop the clutch assembly by momentarily pressing against the side of the driven clutch member and check to see that the motor reverses its direction of rotation.

b. Operational Test.

(1) Load the processor in a darkroom with 100 feet of fresh, unexposed 70-millimeter (mm) film having an ASA daylight speed index of 200 or greater.

(2) Process the film as instructed in the operation portion of TM 11–6740–203–10. While the film is being processed, move a lighted 100-watt incandescent lamp around the processor within approximately 30 inches from the cover assembly.

(3) After the processing of the film is completed (including fixing and washing), dry the film carefully and inspect it for fog, unevenness of development, scratches or any other physical signs of damage. If any defect is noted, refer to the operator's troubleshooting checklist (TM 11–6740–203–10) and to the troubleshooting chart (par. 8*c*).

APPENDIX

REFERENCES

The following references are applicable and available to the maintenance personnel of Photographic Film Processing Unit PH–668/U.

TM 11–401 Elements of Signal Photography.

TM 11–6740–203–10 Operator's Manual, Photographic Film Processing Unit PH–668/U.

[AG 413.53 (29 Jul 58)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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Br Svc Sch (5) except
  USASCS (25)
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  Atlanta Gen Depot (None)
Sig Sec, Gen Depots (10)
Sig Depots (17)
Fld Comd, AFSWP (5)
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Army Pictorial Cen (2)
WRAMC (1)
AFIP (1)
AMS (1)
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USA White Sands Sig Agcy (13)
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Sig Fld Maint Shops (3)
Sig Lab (5)
Mil Dist (1)
USA Corps (Res) (1)
Sectors, USA Corps (Res) (1)
JBUSMC (2)
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  11–5 (2)
  11–6 (2)
  11–7 (2)
  11–16 (2)
  11–55 (2)
  11–57 (2)
  11–127 (2)
  11–128 (2)
  11–500 (AA–AE) (2)
  11–557 (2)
  11–587 (2)
  11–592 (2)
  11–597 (2)
  39–51 (2)
  39–61 (2)
  39–71 (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320–50.

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